

## 2. Core Hormonal Physiology of Childbearing Principles

A new report, *Hormonal Physiology of Childbearing: Evidence and Implications for Women, Babies, and Maternity Care* (2015), synthesizes an extensive literature about hormonally-driven processes of parturition and the early postpartum period.

The following information is drawn from this report.

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**The scientific literature on the hormonal physiology of childbearing reveals core themes and principles. These themes and principles reflect profound interconnections at many levels and over time, as follows:**

**Evolutionary origins.** The hormonal physiology of childbearing has evolved over millions of years to optimize reproductive success. Maternal and infant survival at birth is obviously critical for reproductive success, but equally important for long-term survival are successful lactation and maternal-infant attachment immediately following birth.<sup>1</sup> These hormonally-mediated processes are intertwined and continuous with the biologic processes of parturition. Disruption of perinatal hormonal physiology may thus adversely impact not only labor and birth, but also breastfeeding and maternal-infant attachment via biological bonding.<sup>2</sup> As humans share many reproductive processes with other mammals, animal research helps illuminate human hormonal physiology, especially where human research is currently limited.<sup>1</sup>

**Mother-baby dyad.** Hormonal physiology is interrelated, coordinated, and mutually regulated between mother and baby to optimize outcomes for both. For example, maternal and fetal readiness for labor is precisely aligned at the physiologic onset of term labor to optimize labor efficiency and maternal and newborn transitions. Similarly, skin-to-skin contact after birth mutually regulates maternal and newborn oxytocin systems.<sup>3</sup> As a general principle, effects on maternal hormonal physiology impact fetal/newborn hormonal physiology, and vice versa.

**Beneficial hormonal physiology pathway.** From pregnancy through labor and birth, breastfeeding, and maternal-infant attachment, hormonal processes of physiologic childbearing anticipate and prepare for upcoming processes and biological needs. For example, prelabor upregulation of maternal uterine oxytocin receptors promotes labor efficiency,<sup>4</sup> and prelabor epinephrine-norepinephrine receptor upregulation optimizes fetal adaptations to labor hypoxia and newborn transitions via the fetal catecholamine surge.<sup>5</sup>

**Interorchestration among hormone systems.** The hormone systems described in the *Hormonal Physiology of Childbearing* report – oxytocin, beta-endorphins, epinephrine-norepinephrine and related stress systems, and prolactin – have complex interactions in the perinatal period, including promoting or inhibiting one another's activity.<sup>6</sup> This can amplify hormonal effects, leading to the peaks that characterize physiologic birth. For example, late-labor oxytocin peaks, promoted by high levels of prolactin and oxytocin itself, assist with the pushing stage.<sup>7</sup> Similarly, excessive stress and stress hormones may disrupt labor progress via hormonal interorchestration.<sup>8</sup>

**Cascade of intervention.** Hormonal disruptions can be amplified when one intervention necessitates and leads to another that is used to monitor, prevent, or treat its side effects. This escalation of technology can further disrupt hormonal physiology and introduce extra risks to mother and baby. For example, the reduction in maternal oxytocin that generally follows administration of epidural analgesia<sup>9</sup> may lead to use of synthetic oxytocin to compensate. Prolonged use of synthetic oxytocin may desensitize the oxytocin receptor system<sup>10</sup> and increase the risk of postpartum hemorrhage.

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Access *Hormonal Physiology of Childbearing: Evidence and Implications for Women, Babies, and Maternity Care* (2015) by Dr. Sarah J. Buckley and related material, including individual fact sheets and the full set, at [ChildbirthConnection.org/HormonalPhysiology](http://ChildbirthConnection.org/HormonalPhysiology).

**Concern about long-term impacts.** Non-physiologic exposures during the sensitive perinatal period may disrupt offspring hormone systems, with amplified and/or enduring biological, developmental, and/or behavioral impacts,<sup>11</sup> as found in animal offspring,<sup>12</sup> likely via epigenetic programming effects. High-quality, long-term human studies following fetal/newborn exposure to perinatal drugs and interventions are very limited.<sup>13</sup> Thus, the current evidence-based approach to identifying safe and effective care, based on short-term follow-up and limited examination of hormonally-mediated outcomes such as breastfeeding, may not adequately safeguard mothers and babies. Similarly, conventional shorter-term pharmacologic considerations of fetal/newborn drug exposure (e.g., dose, duration, metabolism) may not adequately safeguard the baby. Current levels of uncertainty about long-term impacts suggest research priorities<sup>14</sup> and support avoiding unneeded interventions.

### **Selected references – see report for additional documentation:**

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